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Quantification of the Transient Behavior of Wind-driven Water Droplets and Rivulet Flows on a Substrate[1] BIN WANG, SONG ZHANG, HUI HU, Iowa State University — Aircraft icing is widely recognized as a significant hazard to aircraft operations. The behavior of wind-driven water droplets and rivulet flows on cold airplane wings can directly and indirectly influence the formation and shape of the resulting ice accretion on the wings, which can significantly affect the surface roughness and the subsequent wing drag and overall aerodynamic performance. In this study, we report the progress made in our recent efforts in developing a novel digital fringe projection technique to achieve instantaneous measurements of the thickness distributions of water droplets and rivulet flows on a substrate to quantify the transient behavior of the wind-driven water droplets and rivulet flows. The effects of the surface properties of the substrate (e.g., hydrophobic, roughness and temperature) on the evolutions of the wind-driven water droplets and rivulet flows were investigated in great detail to elucidate underlying physics in order to improve our understanding about microphysical phenomena associated with aircraft icing phenomena.

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